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Nanocapsules: A delivery system for the Cas9 ribonucleoprotein complex

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CRISPR Cas9 is a gene-editing technique that enables researchers to edit specific parts of DNA sequences. It has been adapted from the bacterial immune system. This system often requires viral vectors to deliver the Cas9 ribonucleoprotein (RNP) complex to the targeted cells. However, the use of viral vectors poses the risk of carcinogenesis, immune response and safety concerns. To overcome these limitations, different delivery systems are being used to deliver the Cas9 RNP complex to the editing tool. Customised synthetic nanoparticles, like nanocapsules, can be used for this purpose. Nanocapsules are made of a polymeric shell and a space is provided where desired substances are encapsulated. To prepare the nanocapsules, a thin glutathione-cleavable covalently crosslinked polymer is synthesised by in situ polymerisation and facile surface modification is used to customise the nanocapsules. This nanocapsule shell is coated around the RNP complex which consists of the Cas9 nuclease and the single-guide RNA. The nanocapsules delivery system provides sustained release, improved bioavailability, biodegradability, alleviated safety issues and targeted delivery. When administered intravenously, they reach the target sites and release the encapsulated Cas9 RNP complex efficiently. This delivery system hence enables the targeted gene editing in vitro without any cytotoxicity.

Keywords: Nanocapsules, CRISPR Cas9, Cas9 ribonucleoprotein complex, Delivery system, Genome editing, Nanotechnology

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